CMD224

16-26 GHz Balanced Low Noise Amplifier

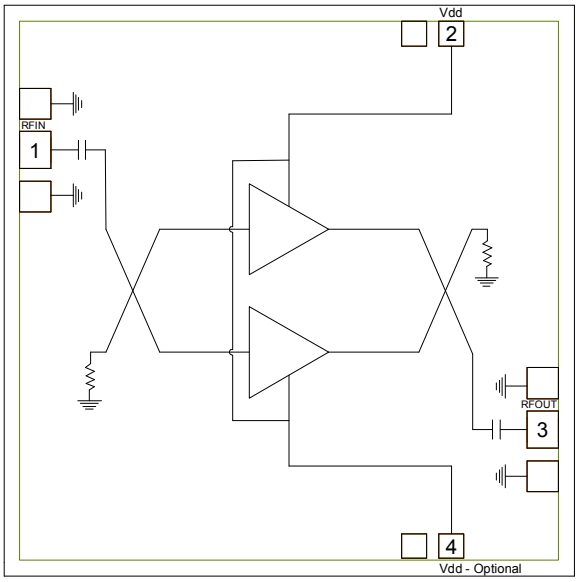
Features

- Low noise figure
- High gain broadband performance
- Single positive supply voltage
- Bias top or bottom
- Small die size

Description

The CMD224 is a broadband MMIC low noise amplifier ideally suited for EW and communication systems where small size and low power consumption are needed. At 21 GHz the device delivers greater than 23 dB of gain with a corresponding output 1 dB compression point of +7 dBm and a noise figure of 2.2 dB. The CMD224 is a 50 ohm matched design eliminating the need for external DC blocks and RF port matching. The CMD224 offers full passivation for increased reliability and moisture protection.

Functional Block Diagram



Electrical Performance - V_{dd} = 4 V, T_A = 25 °C, F = 21 GHz

Parameter	Min	Typ	Max	Units
Frequency Range		16 - 26		GHz
Gain		23		dB
Noise Figure		2.2		dB
Input Return Loss		12		dB
Output Return Loss		13		dB
Output P1dB		7		dBm
Supply Current		110		mA

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Specifications

Absolute Maximum Ratings

Parameter	Rating
Drain Voltage, Vdd	5.5
RF Input Power	+23 dBm
Channel Temperature, Tch	150 °C
Power Dissipation, Pdiss	520 mW
Thermal Resistance	125 °C/W
Operating Temperature	-55 to 85 °C
Storage Temperature	-55 to 150 °C

Operation of this device outside the maximum ratings may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Vdd	2.0	4.0	5.0	V
Idd		110		mA

Electrical performance is measured at specific test conditions. Electrical specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications - V_{dd} = 4 V, T_A = 25 °C

Parameter	Min	Typ	Max	Min	Typ	Max	Units
Frequency Range	17 - 22			16 - 26			GHz
Gain	20	23	26.5	18	22	26.5	dB
Noise Figure		2.2	2.7		2.4	3.2	dB
Input Return Loss		13			13		dB
Output Return Loss		14			12		dB
Output P1dB		8			7		dBm
Output IP3		18			16		dBm
Supply Current	80	110	140	80	110	140	mA
Gain Temperature Coefficient		0.01			0.01		dB/°C
Noise Figure Temperature Coefficient		0.008			0.008		dB/°C

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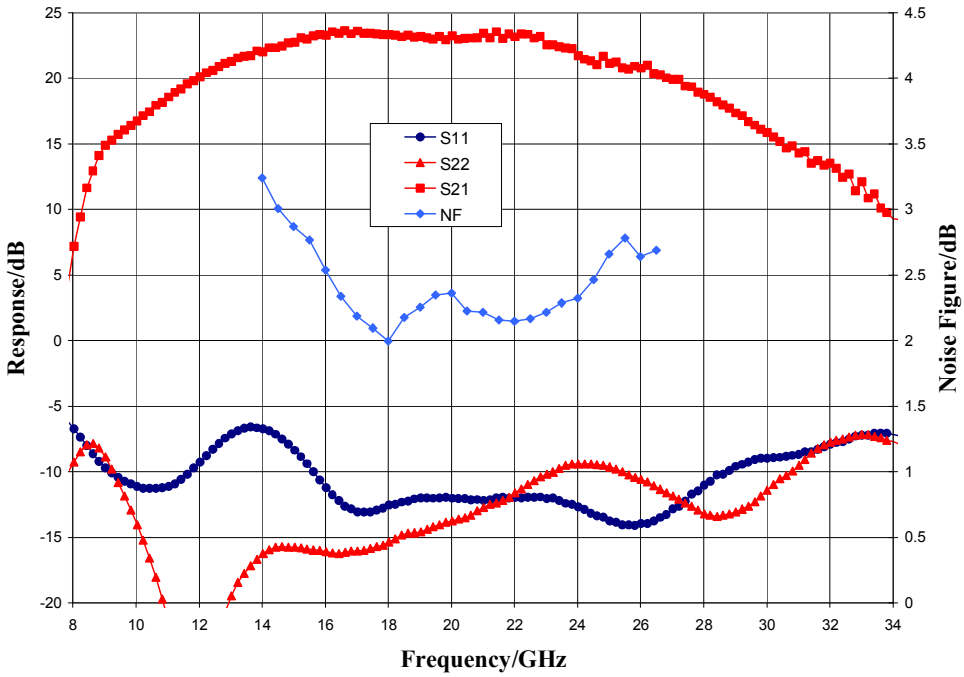
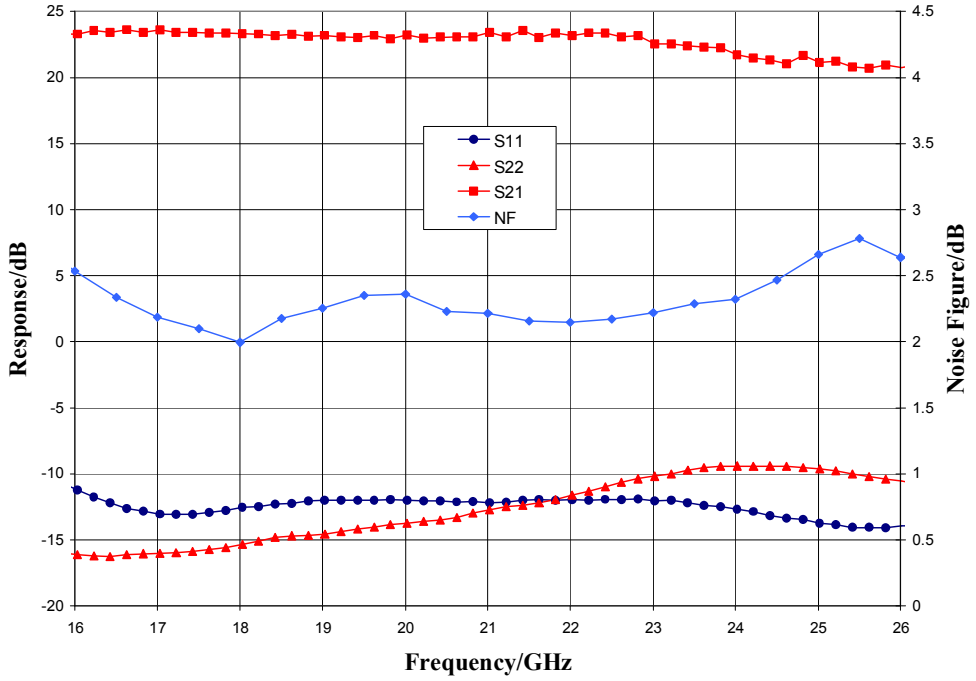
Typical Performance

Broadband Performance, V_{dd} = 4 V, I_{dd} = 110 mA, T_A = 25 °C



Narrow-band Performance, V_{dd} = 4 V, I_{dd} = 110 mA, T_A = 25 °C



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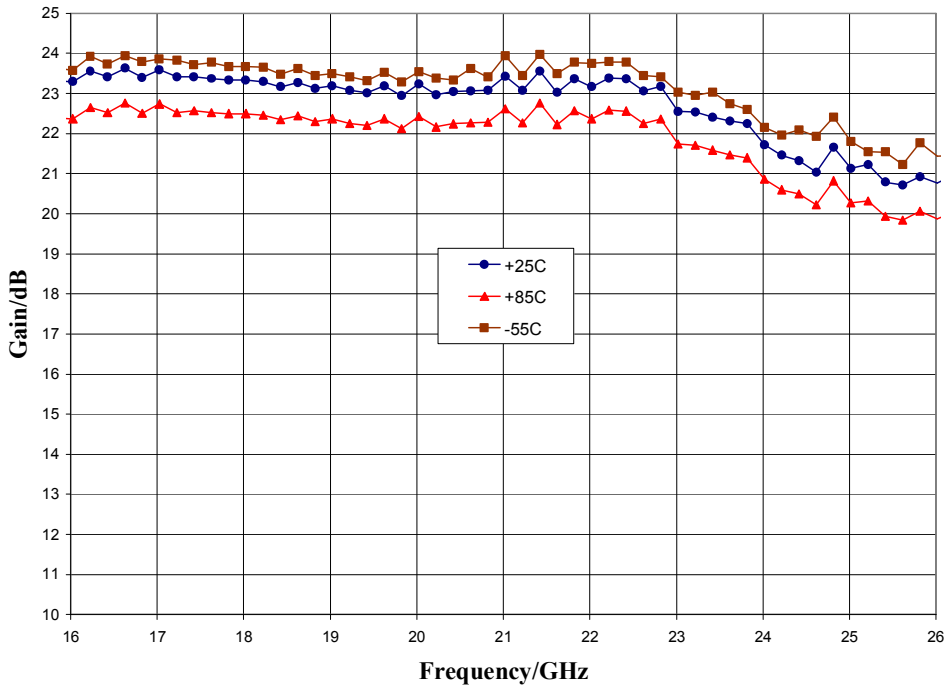
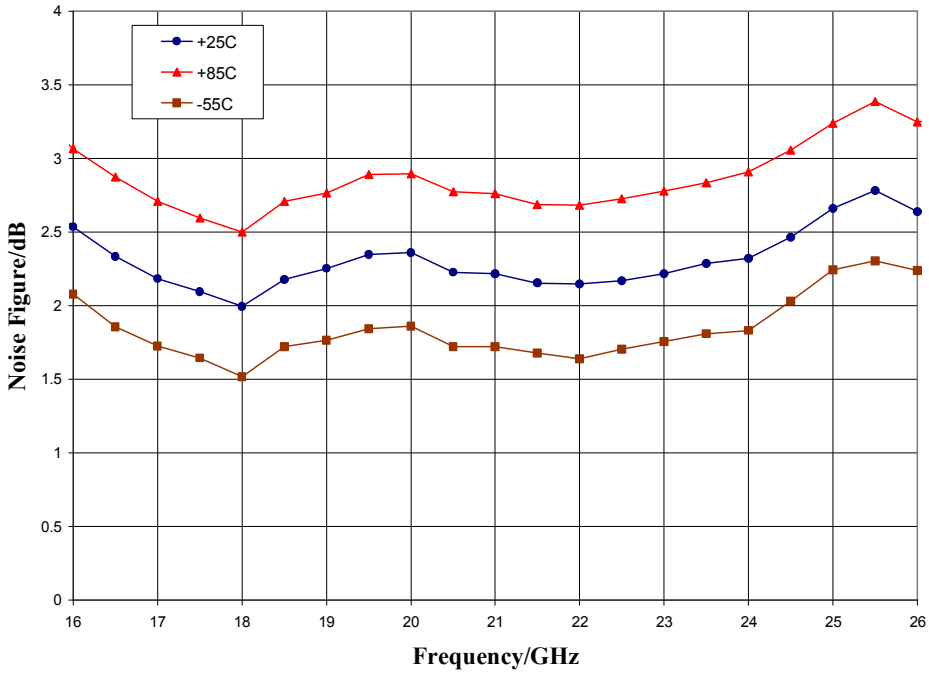
Typical Performance

Gain vs. Temperature, V_{dd} = 4 V



Noise Figure vs. Temperature, V_{dd} = 4 V



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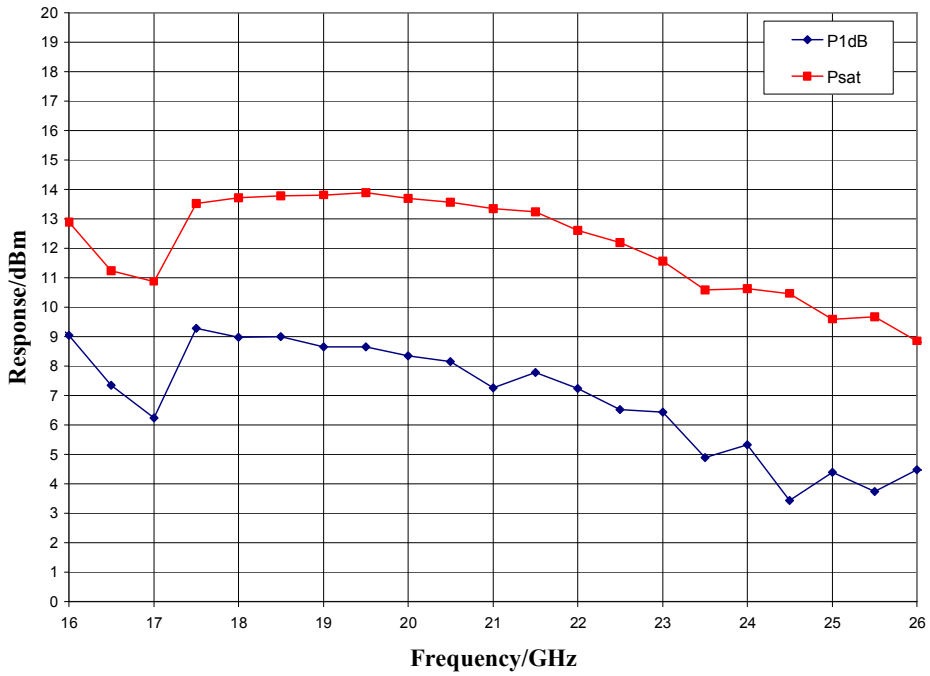
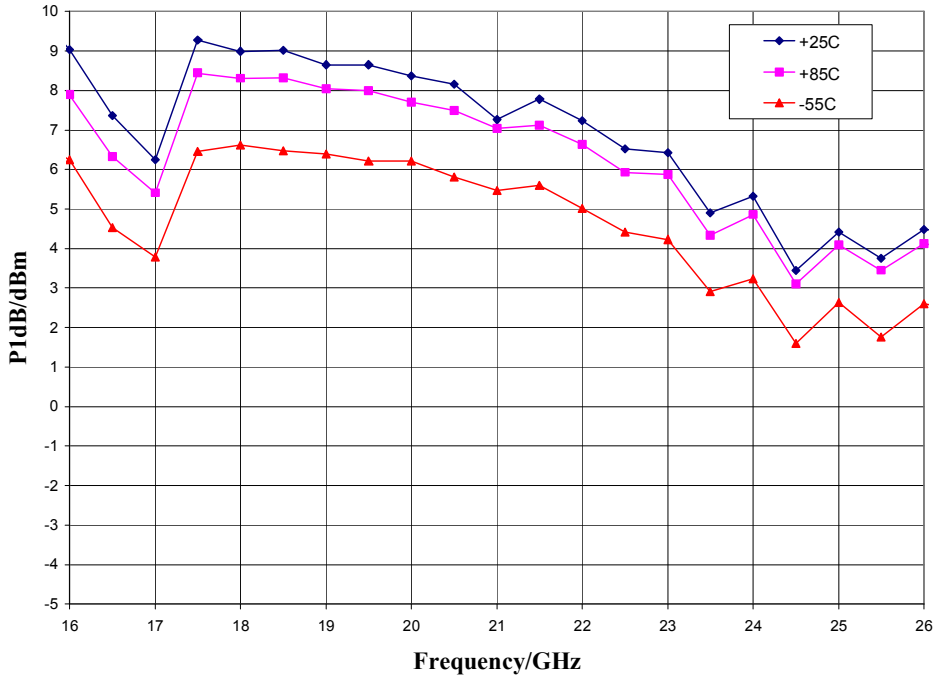
Typical Performance

Output Power, V_{dd} = 4 V, T_A = 25 °C



P1dB vs. Temperature, V_{dd} = 4 V



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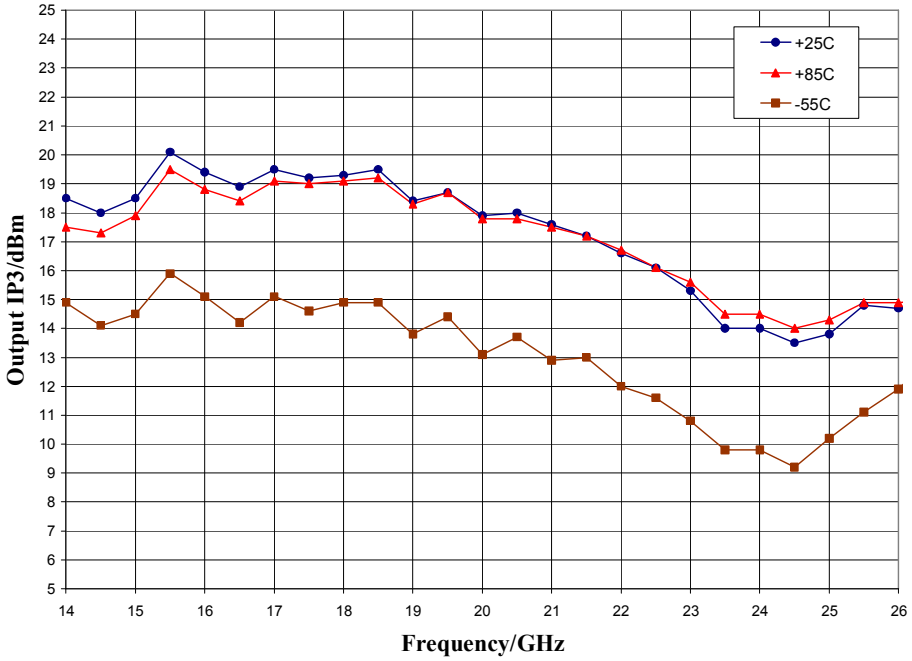
Typical Performance

Output IP3 vs. Temperature, V_{dd} = 4 V



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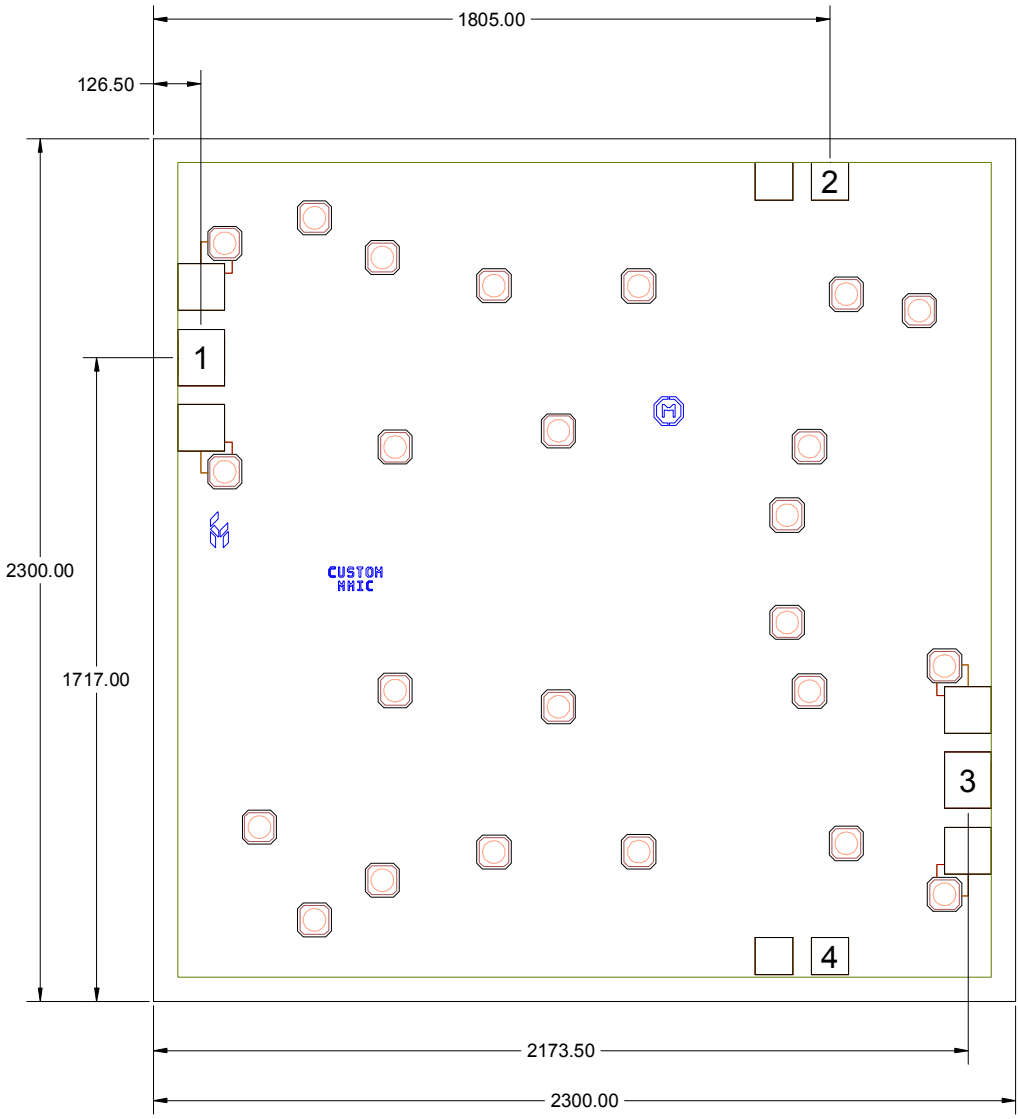
Mechanical Information

Die Outline (all dimensions in microns)



Notes:

1. No connection required for unlabeled pads
2. Backside is RF and DC ground
3. Backside and bond pad metal: Gold
4. Die is 85 microns thick
5. DC bond pads are 100 microns square

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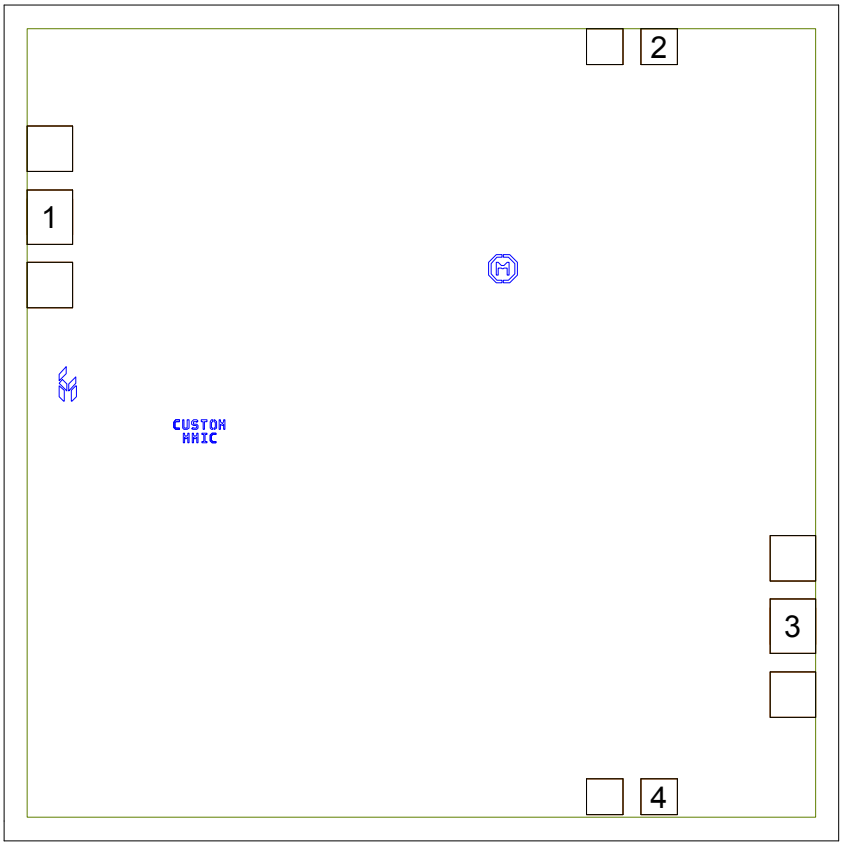
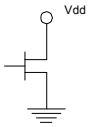
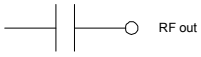
Pad Description

Pad Diagram



Functional Description

Pad	Function	Description	Schematic
1	RF in	DC blocked and 50 ohm matched	
2, 4	Vdd, Vdd-Optional	Power supply voltage Decoupling and bypass caps required. Only one of these pads needs to be connected to DC power supply.	
3	RF out	DC blocked and 50 ohm matched	
Backside	Ground	Connect to RF / DC ground	

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Applications Information

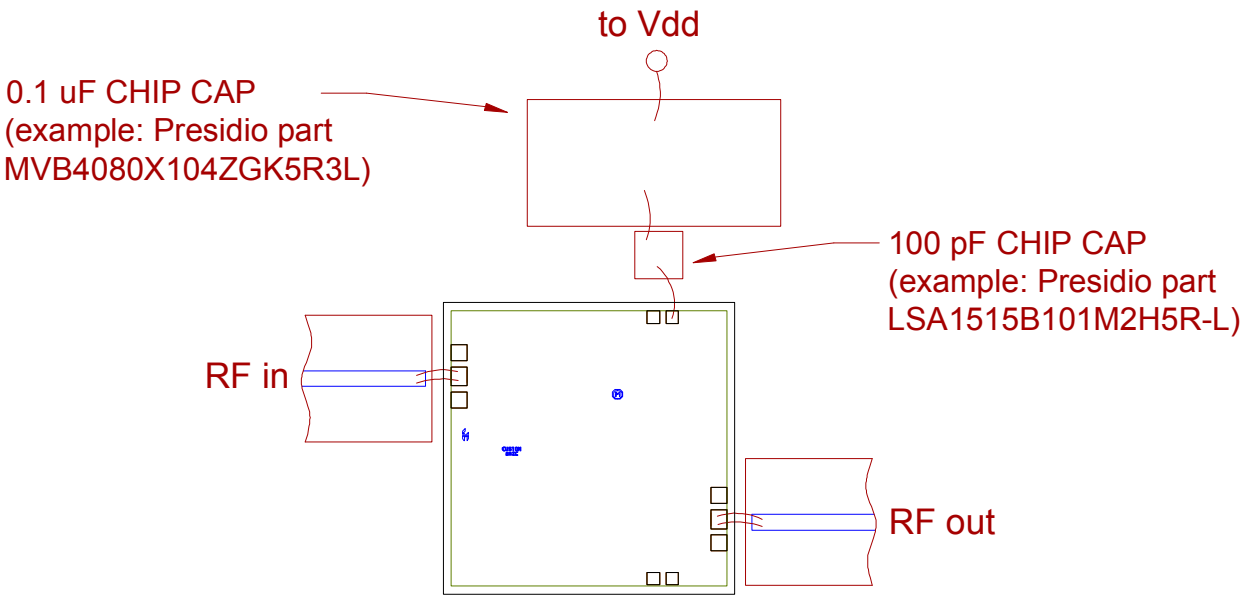
Assembly Guidelines

The backside of the CMD224 is RF ground. Die attach should be accomplished with electrically and thermally conductive epoxy only. Eutectic attach is not recommended. Standard assembly procedures should be followed for high frequency devices. The top surface of the semiconductor should be made planar to the adjacent RF transmission lines, and the RF decoupling capacitors placed in close proximity to the DC connections on chip.

RF connections should be made as short as possible to reduce the inductive effect of the bond wire. Use of a 0.8 mil thermosonic wedge bonding is highly recommended as the loop height will be minimized. The RF input and output require a double bond wire as shown.

The semiconductor is 85 um thick and should be handled by the sides of the die or with a custom collet. Do not make contact directly with the die surface as this will damage the monolithic circuitry. Handle with care.

Assembly Diagram



GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

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Applications Information

Biasing and Operation

The CMD 224 is biased with a positive drain supply. Performance is optimized when the drain voltage is set to +4 V, though it may be set to a minimum of +2.0 V and a maximum of +5 V.

Turn ON procedure:

1.Apply drain voltage V_{dd} and set to +4 V

Turn OFF procedure:

1.Turn off drain voltage V_{dd}

RF power can be applied at any time.

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